

**Device for lengthening bones or bone parts**

The invention relates to a device for lengthening bones or bone parts for transport of segments, with at least two elements which can be moved relative to one another, at least one locking element being able to move axially in or along a guide element, and the at least one locking element being driven axially movably in or along the guide element by means of at least one drive unit.

Such devices are known, for example, in the form of medullary nails made up of two elements, especially bushings, which are movable relative to one another and which can be moved away from one another, for example by means of electric or hydraulic drives, in order to lengthen a bone or to transport a segment.

A disadvantage of the conventional devices is that they provide an extremely small stroke for the segment transport and have an undesirably large installation length. They are also difficult to clean and to operate.

DE 197 08 279 A1 discloses a distraction system for long bones for segment transport, the inside of the medullary nail having a bushing for receiving a securing element for fixing a bone segment, into which bushing a drivable threaded spindle engages. In this way, the length of the segment transport is restricted with a limited cross-sectional size.

DE 195 27 822 C1 describes an intracorporeal medullary nail which is composed of two parts which are movable relative to one another.

A similar device for lengthening bones and tissues is described in US 5,356,411 in which two parts of a distraction device are moved away from one another by means of a spindle.

US 5,720,746 describes a mechanical device for displacing two elements relative to one another, a second element being able to be moved out from the first element.

EP 1 033 112 A2 discloses a medullary nail for bone distraction, in which a coil is integrated in a proximal end region, which coil allows the contactless feed of an electrically driven motor.

A purely mechanically driven distraction device is set forth in US 5,704,938, in which one part of a distraction device can be moved out relative to the other part via a spindle.

It is an object of the present invention to make available a device for lengthening bones or bone parts which eliminates said disadvantages and with which a very considerable stroke is possible together with a limited installation size.

Such a device should also be easy to clean and to disinfect, and in particular also easy to disassemble. Moreover, this device should be able to be operated and controlled with precision.

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This object is achieved by the fact that the drive unit is formed by a motor element, if appropriate with downstream gear and control unit, and by a spindle element adjoining the motor element or the gear, the at least one lock sitting directly on the spindle element, and the spindle element being designed as a threaded rod which extends through the at least one lock and engages with it.

In the present invention, it has proven particularly advantageous to insert at least one locking element in an axially movable manner into a guide element or to guide it along a guide element. The embodiment is preferred in which the at least one locking element is inserted into a guide slot of a guide element and can be moved axially to and fro along this guide slot by means of a spindle element, threaded rod or the like. The spindle element is driven by means of a drive unit or a motor element, if appropriate with upstream gear, and moves the lock in an exact and precise axial movement to and fro in the guide slot. The lock, which if appropriate engages over the outside of the guide element, is used to receive a bone segment which has been separated from a bone or bone part. The bone segment which has been separated from the bone or bone part, and which is fixed on the locking element, is distracted from it, or moved to the opposite bone or bone part, preferably very slowly, for example at 0.5 mm to 1.5 mm a day, preferably at 1 mm a day, so that in this way it is possible to ensure transport of the

segment and a restoration and growth of the bone through osteosynthesis.

It should also fall within the context of the present invention for the lock to engage, for example, on